KEY

Unit 6 Day 11 Notes on Exponential Functions (Growth and Decay)

Write the equation of the exponential function based on the following tables:

x	-1	0	1	2	3
y	4	12	36	108	324

×3 ×3 ×3 ×3

$y = 12 \cdot 3^x$

x	-2	-1	0	1	2
y	4	6	9	13.5	20.25

×1.5 ×1.5 ×1.5 ×1.5

$y = 9 \cdot 1.5^x$

Applications of Growth and Decay

Growth/Decay Model

$$y = a(1 \pm r)^t$$

"rate" as a decimal

Amount at time, t = initial amount $(1 \pm \text{rate})^{\text{time}}$

"+" for growth
"-" for decrease

Ex 1 – Compound Interest

You deposit $500 in an account that pays 8% annual interest compounded yearly.

a) Is this growth or decay?

Growth

b) Write the equation to model this.

$y = 500(1 + .08)^t$

c) How much will be in the account after 6 years?

$y = 500(1.08)^6$

$793.44

d) How much will be in the account after 35 years?

$y = 500(1.08)^{35}$

$7,392.67

Ex 2 – Cell Phone Value

You purchase a cell phone for $125. The value of the phone decreases by about 40% each year.

a) Is this growth or decay?

Decay

b) Write the equation to model this

$y = 125(1 - .4)^t$

c) How much would the phone be worth after 6 years?

$y = 125(.6)^6$

$5.83

d) Would the phone ever be worth $0 according to this model?

Nope!

Ex 3 – Computer Use Growth

$a = 600,000,000$

One computer industry expert reported that there were about 600 million computers in use worldwide in 2001 and that the number was increasing at an annual rate of 10%.

$r = .1$ t = # of years since 2001 ✱

a) Write a function that models the number of computers in use over time.

$$y = 600,000,000(1 + .1)^t$$

b) Predict the number of computers that would have been in use in 2015. $t = 14$

$$y = 600,000,000(1.1)^{14}$$

$$= \boxed{2,278,499,001 \text{ computers!}}$$

c) Do you think this is accurate?

The answer is probably a high estimate – it wouldn't continue growing exponentially forever

Ex 4 – Home Purchase

You have inherited land that was purchased for $30,000 in 1960. The value of the land increased approximately 5% per year.

$a = 30000$

$r = .05$

a) Write a function that models the value of the land over time. t = # of years since 1960

$$y = 30,000(1 + .05)^t$$

b) Predict the value of the land in 2017. $t = 57$ years

$$y = 30,000(1.05)^{57}$$

$$\boxed{\$484,073.49}$$

Growth or Decay?

$y = 3(1.9)^x$	$y = .3(1.9)^x$	$y = 5\left(\frac{3}{5}\right)^x$	$y = 5\left(\frac{5}{3}\right)^x$	$y = 5\left(\frac{5}{3}\right)^{-x} = 5\left(\frac{3}{5}\right)^x$
G	G	D	G	D